10-22-1951

Test. 469: Minneapolis-Moline BF

The Experiment Station
University of Nebraska College of Agriculture
W. V. Lambert, Director, Lincoln, Nebraska

Department of Agricultural Engineering

Dates of test: October 22 to October 27, 1951.
Manufacturer: MINNEAPOLIS-MOLINE COMPANY, MINNEAPOLIS, MINNESOTA
Manufacturer's rating: Not rated.

NEBRASKA TRACTOR TEST NO. 469

MINNEAPOLIS-MOLINE BF

BELT HORSEPOWER TESTS

Hp	Crank shaft speed rpm	Fuel Consumption: Gal per hour	Fuel Consumption: Hp-hr per gal	Fuel Consumption: Lb per hp-hour	Water used gal per hour	Temp Deg F: Cooling med	Temp Deg F: Air	Barometer inches of mercury
TEST B—100% MAXIMUM LOAD—TWO HOURS								
27.12	1800	2.771	9.79	0.623	0.00	162	50	29.070
TEST C—OPERATING MAXIMUM LOAD—ONE HOUR								
26.85	1800	2.598	10.33	0.590	0.00	168	58	29.050
TEST D—RATED LOAD—ONE HOUR								
23.53	1800	2.309	10.19	0.598	0.00	162	55	29.050
TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)								
23.57	1803	2.302	10.24	0.596	...	161	54	.....
1.76	1848	0.994	1.77	3.443	...	144	54	.....
11.95	1825	1.560	7.66	0.796	...	149	53	.....
24.55	1606	2.283	10.75	0.567	...	164	52	.....
6.04	1846	1.220	4.95	1.232	...	147	51	.....
18.15	1854	1.938	9.37	0.651	...	152	50	.....
14.34	1797	1.716	8.36	0.730	0.00	153	52	29.050

DRAWBAR HORSEPOWER TESTS

Hp	Draw bar pull lb	Speed miles per hr	Crank shaft speed rpm	Slip of drive wheels %	Fuel Consumption: Gal per hour	Fuel Consumption: Hp-hr per gal	Fuel Consumption: Lb per hp-hr	Water used gal per hour	Temp Deg F: Cooling med	Temp Deg F: Air	Barometer inches of mercury
TEST F—100% MAXIMUM LOAD—3rd GEAR											
24.12	1807	5.01	1799	5.99	—Not Recorded—				161	65	28.880
TEST G—OPERATING MAXIMUM LOAD											
15.29	2725	2.10	1800	14.95	—Not Recorded—				137	62	28.875
22.85	2547	3.36	1802	10.63	—Not Recorded—				153	64	28.870
23.90	1789	5.01	1796	5.78	—Not Recorded—				157	65	28.880
18.75	532	13.21	1799	1.98	—Not Recorded—				162	62	28.880
TEST H—RATED LOAD—TEN HOURS—3rd GEAR											
19.12	1414	5.07	1801	5.21	2.100	9.10	0.670	0.00	149	63	28.875
TEST J—OPERATING MAXIMUM LOAD—3rd GEAR											
22.25	1749	4.77	1802	12.19	—Not Recorded—				130	44	29.115

FUEL, OIL and TIME Gasoline octane No ASTM 76 Research 82 (rating taken from oil company's typical inspection data); weight per gallon 6.098 lb **Oil** SAE 20; to motor 1.481 gal; drained from motor 0.889 gal **Total time motor was operated** 46 hours.

CHASSIS Type tricycle **Serial No** R3292 **Tread width** rear 52 to 76 front 6⅜" and 13⅜" **Wheel Base** 79" **Hydraulic control system** direct engine drive **Advertised speeds mph** first 2.42 second 3.67 third 5.23 fourth 13.12 reverse 2.81 **Belt pulley** diam 10" face 6½" rpm 1160 **Belt speed** 3040 fpm **Clutch** single plate dry disk clutch operated by left foot pedal **Seat** pressed steel seat on coil spring with hydraulic snubber **Brakes** external contracting bands operated by right foot on pedals either independently or interlocked **Equalized** by foot action only **Power take-off** standard type.

ENGINE Make Hercules **Type** 4 cylinder vertical **Serial No** 2453318 **Crankshaft mounted** lengthwise **Head** L **Lubrication** pressure **Bore and Stroke** 3¼" x 4" **Rated rpm** 1800 **Compression ratio** 6.8 to 1 **Displacement** 133 cu in **Port Diameter Valves** inlet 1.250 exhaust 1.125 **Governor** flyball variable speed **Carburetor Size** ⅞" **Ignition System** battery **Starting System** 6 volt battery **Air Cleaner** oil washed wire mesh **Muffler** was used **Oil Filter** replaceable element **Cooling medium temperature control** thermostat.

REPAIRS AND ADJUSTMENTS Governor spring tension was adjusted before starting test C.

REMARKS All test results were determined from observed data and without allowances, additions or deductions. Tests B and F were made with carburetor set for 100% maximum belt horsepower and data from these tests were used in determining the horsepower to be developed in tests D and H, respectively. Tests C, D, E, G, H, and J were made with an operating setting of the carburetor (selected by the manufacturer) of 99.9% of maximum belt horsepower.

TIRES, WHEELS and WEIGHT

	Tests F, G & H	Test J	Test K
Rear wheels			
Type	Pressed steel	Pressed steel	No smaller tires suggested by manufacturer
Liquid ballast	241 lb each	None	
Added cast iron	584 lb each	None	
Rear tires			
No. and size	Two 10-28	Two 10-28	
Ply	4	4	
Air pressure	14 lb	12 lb	
Front wheels			
Type	Pressed steel	Pressed steel	
Liquid ballast	None	None	
Added cast iron	52 lb each	None	
Front tires			
No. and size	Two 5.50-15	Two 5.00-15	
Ply	4	4	
Air pressure	28 lb	28 lb	
Height of drawbar	17 inches	17½ inches	
Static weight			
Rear end	3336 lb	1686 lb	
Front end	1120 lb	1024 lb	
Total weight as tested with operator	4636 lb	2894 lb	

HORSEPOWER SUMMARY

	Draw-bar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F and 29.92" Hg)	25.11	27.64
2. Observed maximum horsepower tests F & B)	24.12	27.12
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (formerly ASAE and SAE ratings)	18.83	23.49

We, the undersigned, certify that this is a true and correct report of official tractor test No. 469.

L. F. LARSEN
Engineer in Charge

C. W. SMITH
F. D. YUNG
L. W. HURLBUT
Board of Tractor Test Engineers

EXPLANATION OF TEST REPORT

TEST A: The manufacturer's representative operates the tractor for a minimum of 12 hours, using light to heavy drawbar loads in each gear. This serves as a preliminary period for limber up, general observation and adjustments. No data are recorded during this preliminary run.

BELT HORSEPOWER TESTS

TEST B: The throttle valve is held wide open and the belt load on the dynamometer is adjusted so that the engine is as near as practical to the rated speed recommended by the manufacturer. Carburetor, ignition timing and manifold adjustments are all set for maximum engine power.

TEST C: The manufacturer has an opportunity to select a more practical carburetor setting which may slightly lower the power output but give better fuel economy. As in test B, the throttle valve is held wide open and the load is adjusted to give the rated engine speed. Tests B and C may be the same, as in the case of a diesel engine where the manufacturer wants to use the same setting as in test B. The same setting is used for tests D, E, G, H, J and K.

TEST D: The throttle control lever is set so the governor will maintain rated engine speed when rated load is applied. Rated load is 85% of 100% maximum, as obtained in test B, corrected to standard conditions.

TEST E: This test serves to show how well the governor controls the engine speed when the following loads are applied: rated load, no load, ½ load, maximum load at wide-open throttle, ¼ load and ¾ load. This test also shows some significant fuel consumption results for these loads. The average fuel consumption given for this test is quite significant. The average farm tractor is subjected to a varying load condition throughout the year.

DRAWBAR HORSEPOWER TESTS

In all drawbar tests the pull exerted by the tractor is transmitted by a hydraulic pressure cylinder to a recording instrument in the test car. All tests are made on the same dirt test course which is maintained by grading, sprinkling and rolling so that it remains very nearly the same throughout the season. The same tires, wheels and weights are used for all tests except J and K.

TEST F: The tractor is operated in the gear designated by the manufacturer as rated gear (the gear recommended as most suitable for plowing). The carburetor is set as in test B. The throttle valve is held wide open and the drawbar load adjusted to maintain rated engine speed. Results of this test are used to determine the rated load for test H.

TEST G: The tractor is tested for maximum drawbar horsepower in each gear, using the more efficient carburetor setting as determined in test C. The throttle valve is held wide open and the load is applied so that the engine runs at rated engine speed. When operating in the lower gears the tractor often is unable to develop maximum horsepower because of excessive wheel slippage. Then the load is reduced until slippage approaches 16%.

TEST H: This test lasts 10 hours and is the only drawbar test where fuel consumption is measured. The load applied is 75% of 100% maximum drawbar horsepower (test F) corrected to standard conditions. The throttle lever is set so that the governor gives rated engine speed.

TEST J: The tractor is operated in rated gear with all added weight removed. This test shows the effect of the removal of added weight on the performance of the tractor.

TEST K: Similar to test J except that the smallest tires and lightest wheels recommended by the manufacturer are used.